

TABLE OF CONTENTS

Note: The Supplemental Plan Formulation Report and Supplemental EIS/EIR has been integrated into one document to meet both the Corps planning and environmental requirements. Sections noted with a “” are required for compliance with the NEPA and sections noted with a “#” are required for compliance with CEQA.*

CHAPTER 1.0 INTRODUCTION.....	1-1
*1.1 Purpose and Need.....	1-1
1.2 Authorization	1-2
1.3 Study Location.....	1-4
1.4 Background.....	1-4
1.5 National Environmental Policy Act and California Environmental Quality Act.....	1-6
1.6 Public Review of Draft Report	1-7
1.7 Public Concerns.....	1-7
1.8 Related Studies and Reports.....	1-10
1.9 Report Organization.....	1-15
 #*CHAPTER 2.0 AFFECTED ENVIRONMENT	2-1
2.1 Existing Conditions	2-1
2.2 Without-Project Future Conditions.....	2-100
 CHAPTER 3.0 PROBLEMS AND OPPORTUNITIES	3-1
3.1 Flood Risk with Current Improvements	3-1
3.2 System Inadequacies.....	3-1
3.3 Flood Characteristics	3-2
3.4 Future Without-Project Flood Risk and Damage.....	3-2
3.5 Ecosystem Restoration Problems and Opportunities.....	3-5
3.6 Other Water Resources Problems and Opportunities	3-9
 CHAPTER 4.0 PLAN FORMULATION AND SCREENING OF FLOOD DAMAGE REDUCTION MEASURES.....	4-1
4.1 Plan Formulation Process	4-1
4.2 Planning Objectives	4-1
4.3 Planning Constraints and Criteria.....	4-2
4.4 Flood Damage Reduction Measures	4-2
4.5 Combining Measures.....	4-23
4.6 Alternatives to Be Considered in Detail	4-23
 #*CHAPTER 5.0 FLOOD CONTROL ALTERNATIVES	5-1
5.1 Alternative 1: No Action	5-1
5.2 Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation.....	5-3
5.3 Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation	5-10
5.4 Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation.....	5-16
5.5 Alternative 5: Stepped Release to 160,000 cfs	5-21

5.6	Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam.....	5-29
5.7	Alternative 7: Stepped Release to 180,000 cfs	5-31
5.8	Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation	5-36
#*CHAPTER 6.0 ECOSYSTEM RESTORATION FOR FLOOD PLAIN AND FISHERIES RESOURCES.....		6-1
6.1	Flood Plain Restoration.....	6-1
6.2	Fisheries Restoration.....	6-26
6.3	Selection of the NER Plan	6-37
#*CHAPTER 7.0 ENVIRONMENTAL EFFECTS AND MITIGATION		7-1
7.1	Hydrology and Hydraulics	7-1
7.2	Geology, Seismicity, and Soils	7-11
7.3	Water Supply	7-21
7.4	Hydropower	7-27
7.5	Land Use and Socioeconomics.....	7-33
7.6	Recreation.....	7-44
7.7	Fisheries.....	7-61
7.8	Vegetation	7-71
7.9	Wildlife	7-88
7.10	Water Quality	7-104
7.11	Cultural Resources.....	7-113
7.12	Traffic and Circulation	7-137
7.13	Air Quality	7-150
7.14	Noise	7-160
7.15	Visual Resources	7-173
7.16	Public Health and Safety.....	7-186
7.17	Public Services.....	7-195
7.18	Summary	7-202
CHAPTER 8.0 EVALUATION AND COMPARISON OF FLOOD CONTROL ALTERNATIVES.....		8-1
8.1	Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation.....	8-1
8.2	Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation	8-2
8.3	Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation.....	8-3
8.4	Alternative 5: Stepped Release to 160,000 cfs	8-4
8.5	Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam.....	8-5
8.6	Alternative 7: Stepped Release to 180,000 cfs	8-7
8.7	Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation	8-8
8.8	Summary Comparison of Flood Damage Reduction Alternatives.....	8-8

CHAPTER 9.0	CUMULATIVE AND GROWTH-INDUCING EFFECTS AND OTHER REQUIRED DISCLOSURES	9-1
9.1	Introduction	9-1
#9.2	Cumulative Effects.....	9-1
#9.3	Growth-Inducing Effects.....	9-11
9.4	Other Required Disclosures.....	9-12
9.5	Compliance with Applicable Laws, Policies, and Plans	9-15
CHAPTER 10.0	PLAN SELECTION AND IMPLEMENTATION	10-1
10.1	National Economic Development and National Ecosystem Restoration Plans.....	10-1
10.2	Future Actions	10-2
10.3	Implementation Requirements	10-4
10.4	Cost-Sharing Considerations.....	10-4
10.5	Federal and Nonfederal Responsibilities	10-6
CHAPTER 11.0	CONCLUSIONS.....	11-1
*CHAPTER 12.0	DOCUMENT RECIPIENTS	12-1
12.1	Elected Officials and Representatives.....	12-1
12.2	U.S. Government Departments and Agencies.....	12-1
12.3	State of California Government Agencies	12-2
12.4	Local Government.....	12-3
12.5	Special Interest Groups	12-4
CHAPTER 13.0	LIST OF PREPARERS	13-1
	Sacramento Area Flood Control Agency.....	13-1
	U.S. Army Corps of Engineers	13-1
	Jones & Stokes.....	13-1
CHAPTER 14.0	REFERENCES	14-1
14.1	Printed References	14-1
14.2	Personal Communications	14-20
*INDEX		
GLOSSARY		
LIST OF ACRONYMS AND ABBREVIATIONS		

APPENDIX A. ENVIRONMENTAL

(Bound separately. Available from the U.S. Army Corps of Engineers on request.)

APPENDIX B. ECONOMICS

(Bound separately. Available from the U.S. Army Corps of Engineers on request.)

APPENDIX C. ENGINEERING

(Bound separately. Available from the U.S. Army Corps of Engineers on request.)

APPENDIX D. REAL ESTATE

(Bound separately. Available from the U.S. Army Corps of Engineers on request.)

LIST OF TABLES

Table	Follows Page
1-1 Important NEPA and CEQA Terms	on 1-15
2-1 Existing Hydrologic Conditions at Folsom Reservoir During Various Flood Events	2-8
2-2 Probable Maximum Flood Mean 3-Day Flow American River above Folsom	on 2-11
2-3 Existing Diversion Ponits and Service Areas.....	2-14
2-4 Fish Species Occurring in the Lower American River.....	2-28
2-5 Special-Status Plants That Occur or Have the Potential to Occur in the Project Area.....	2-36
2-6 Special-Status Wildlife That Are Known to Occur or Could Occur in the Project Area	2-44
2-7 Known Cultural Resource Sites in Folsom Reservoir Vicinity.....	2-78
2-8 Known Cultural Resource Sites in Folsom Reservoir Project Area.....	2-78
2-9 Known Archeological Sites, Lower American River Project Area.....	2-78
2-10 Historic Resources in the Lower American River of Potential Effect	2-78
2-11 Known Cultural Resouces in Yolo and Sacramento Bypasses Project Area	2-80
2-12 Known Cultural Resource Sites, Ecosystem Restoration Project Area.....	2-80
2-13 Level of Service Criteria for Freeways	on 2-80
2-14 Peak Period Person-Miles of Travel on LOS F Roadways	on 2-81
2-15 Average Daily Traffic Volumes on Selected Roadways.....	2-82
2-16 Federal and State Ambient Air Quality Standards	2-84
2-17 Summary of Carbon Monoxide, Ozone, and PM10 Monitoring Data	2-86
2-18 Noise Level Performance Standards for New Projects and Development	on 2-90
2-19 Critical Elevations of EID Sewage Lift Stations.....	on 2-98
3-1 Probability of Nonfailure from Specific Events Under Without-Project Conditions.....	on 3-3
4-1 Project Performance Analysis	4-18
4-2 Summary of Flood Control Measures	4-24
5-1 Accomplishments and Residual Risk of Alternative 1	on 5-3

5-2	Accomplishments and Residual Risk of Alternative 2	on 5-10
5-3	Accomplishments and Residual Risk of Alternative 3.....	on 5-16
5-4	Accomplishments and Residual Risk of Alternative 4.....	on 5-21
5-5	Summary of Drainage Facilities.....	on 5-23
5-6	Drainage Facilities Requiring Modifications	5-24
5-7	Water Intake Facilities Modifications	on 5-24
5-8	PNP Mitigation Areas and Amounts.....	5-24
5-9	Recommended Levee Fixes for Hydraulic Mitigation	5-26
5-10	Accomplishments and Residual Risk of Alternative 5.....	5-29
5-11	Accomplishments and Residual Risk of Alternative 6.....	on 5-31
5-12	Accomplishments and Residual Risk of Alternative 7.....	on 5-35
5-13	Accomplishments and Residual Risk of Alternative 8.....	on 5-37
6-1	Initial Screening–Ecosystem Restoration Measures – Urrutia Site.....	6-24
6-2	Initial Screening–Ecosystem Restoration Measures – Woodlake Site.....	6-24
6-3	Initial Screening–Ecosystem Restoration Measures – Bushy Lake Site	6-24
6-4	Initial Screening–Ecosystem Restoration Measures – Arden Bar Site	6-24
6-5	Initial Alternatives (Best Buy Plans for Urrutia).....	6-27
6-6	Initial Alternatives (Best Buy Plans for Woodlake).....	6-27
6-7	Initial Alternatives (Best Buy Plans for Bushy Lake).....	6-27
6-8	Initial Alternatives (Best Buy Plans for Arden Bar)	6-27
6-9	Estimated (from Modeling) Annual Early-Life-Stage Salmon Mortality (%) in Relation to Various Water Temperature Shutter Control Configurations and Methods at Folsom Dam, by General Water Year-Type	on 6-35
6-10	Initial Alternatives (Best Buy Plans for Fisheries Ecosystem Restoration).....	on 6-36
6-11	Fisheries Ecosystem Restoration Measure	on 6-36
6-12	National Ecosystem Restoration Plan	6-38
7-1	Hydrologic Conditions at Folsom Reservoir during Various Flood Events under Alternative 1: No Action	7-4

7-2	Hydrologic Conditions at Folsom Reservoir during Various Flood Events under Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation	7-4
7-3	Hydrologic Conditions at Folsom Reservoir during Various Flood Events under Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation	7-4
7-4	Hydrologic Conditions at Folsom Reservoir during Various Flood Events under Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevatoin	7-6
7-5	Hydrologic Conditions at Folsom Reservoir during Various Flood Events under Alternative 5: Stepped Release to 160,000 cfs	7-6
7-6	Hydrologic Conditions at Folsom Reservoir during Various Flood Events under Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam	7-8
7-7	Hydrologic Conditions at Folsom Reservoir during Various Flood Events under Alternative 7: Stgepped Release to 180,000 cfs	7-8
7-8	Hydrologic Conditions at Folsom Reservoir during Various Flood Events under Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation	7-10
7-9	Agricultural Land Uses Affected in the Yolo and Sacramento Bypasses	7-40
7-10	Estimated Inundation Levels of Recreation Facilities at Folsom Reservoir	7-52
7-11	Vegetation Types Affected by Construction- and Operation-Related Activities	7-76
7-12	Total Estimated Number of Construction-Related Vehicles Generated by each Alternative ..on	7-138
7-13	Regional and Local Access to Restoration Sites	on 7-147
7-14	Construction Vehicle Trip Generation	on 7-148
7-15	Estimated Emissions Generated during Construction of Each Project Alternative.....	on 7-153
7-16	Estimated Emissions Generated during Construction of Alternative 9.1 through 9.4	on 7-159
7-17	Noise Emission Levels Typical for Construction Equipment	on 7-162
7-18	Estimated Construction Noise in the Project Area	on 7-163
7-19	Estimated Blasting Noise in the Project Area	on 7-170
7-20	Summary of Effects and Mitigation Measures of Project Alternatives 1 through 8	7-202
7-21	Summary of Effects and Mitigation Measures of Project Alternatives 9.1 through 9.5	7-202
8-1	Estimated Costs of Alternative 2 (3.5-Foot Dam Raise/478-Foot Flood Pool Elevation)	8-2
8-2	Benefits and Costs of Alternative 2 (3.5-Foot Dam Raise/478-Foot Flood Pool Elevation)	8-2

8-3	Estimated Costs of Alternative 3 (Seven-Foot Dam Raise/482-Foot Flood Pool Elevation)	8-4
8-4	Benefits and Costs of Alternative 3 (Seven-Foot Dam Raise/482-Foot Flood Pool Elevation)	8-4
8-5	Estimated Costs of Alternative 4 (Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation)	8-4
8-6	Benefits and Costs of Alternative 4 (Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation)	8-4
8-7	Estimated Costs of Alternative 5 (Stepped Release to 160,000 cfs)	8-6
8-8	Benefits and Costs of Alternative 5 (Stepped Release to 160,000 cfs)	8-6
8-9	Estimated Costs of Alternative 6 (Stepped Release to 160,000 cfs and New Outlet at Folsom Dam)	8-6
8-10	Benefits and Costs of Alternative 6 (Stepped Release to 160,000 cfs and New Outlet at Folsom Dam)	8-6
8-11	Estimated Costs of Alternative 7 (Stepped Release to 180,000 cfs)	8-8
8-12	Benefits and Costs of Alternative 7 (Stepped Release to 180,000 cfs)	8-8
8-13	Estimated Costs of Alternative 8 (Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/782-Foot Flood Pool Elevation)	8-8
8-14	Benefits and Costs of Alternative 8 (Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/782-Foot Flood Pool Elevation)	8-8
8-15	Summary Comparison of the No Action Plan and Project Alternatives	8-8
8-16	Summary Comparison of Plans	8-10
8-17	Derivation for the Federally Supportable Folsom Enlargement Plan	on 8-12
8-18	Derivation for the Federally Supportable Downstream Levee Modification Plan	on 8-13
10-1	National Ecosystem Restoration Cost Sharing	10-2
10-2	Future Actions	on 10-3
10-3	Estimated Cost Sharing of Alternative 2 (3.5-Foot Dam Raise/478-Foot Flood Pool Elevation)	10-2
10-4	Estimated Cost of Sharing Alternative 3 (Seven-Foot Dam Raise/ 482-Foot Flood Pool Elevation)	10-6
10-5	Estimated Cost of Sharing Alternative 4 (Twelve-Foot Dam Raise/ 487-Foot Flood Pool Elevation)	10-6

LIST OF PLATES

Plate

1-1	Location and Vicinity Map
1-2	Schedule and Flood Risk of Lower American River Watershed Project
2-1	Existing Flood Control Features in the Sacramento Area
2-2	Frequency Curves, American River at Fair Oaks, Without-Project Advance Release Scenarios
2-3	Recreation Areas at Folsom Reservoir
2-4	Wind Rose Depicting Average Wind Speed and Directional Frequency at Mather Air Force Base
2-5	Land Use Compatibility for Community Noise
2-6	Folsom Dam and Reservoir Variable Flood Control Diagram
3-1	American River Flood Plain
4-1	Detention Dam and Vicinity
5-1	Folsom Enlargement Plan
5-2	Dam Raise Sections
5-3	Folsom Dam Raise Alternatives Plan and Section
5-4	Typical Embankment Raising Sections
5-5a	Folsom Dam Enlargement Peninsula Borrow Area
5-5b	Folsom Dam Enlargement Mississippi Bar Borrow Area
5-6a	Temporary Construction Bridge Alternative 1
5-6b	Temporary Construction Bridge
5-7	Hydrograph for 1 in 200 Year Event American River at Fair Oaks Raise Plan with Pre-Release
5-8	Frequency Curves American River at Fair Oaks Raises with Pre-Release
5-9a	Exceedance Frequency per 100 Years without Advance Release

5-9b	Exceedance Frequency per 100 Years with Advance Release
5-10	Photo-simulation of Alternative 4, Twelve-foot Folsom Dam Raise
5-11	Levee and Floodwall Details Typical Sections
5-12	Typical Schematic of Sump Lower American River
5-13	Sacramento Weir Plan and Section
5-14	Hydraulic Mitigation Stepped Release Alternatives
5-15	Hydraulic Mitigation Levee Sections
5-16	145-160,000 cfs Stepped Release Plan Lower American River Plan Components
5-17	Hydrographs for 1 in 200 Year Event American River at Fair Oaks Step Plan with Pre-Release
5-18	Frequency Curves American River at Fair Oaks Step Plans with Pre-Release
5-19	145-180,000 cfs Stepped Release Plan Lower American River Plan Components
5-20	Howe Avenue Bridge Relocation
5-21	UPRR Trestle Modifications and New Flood Gate Plan, Profile, and Section
5-22	Guy West Bridge Modifications Elevation, Section, and Detail
6-1	Lower American River Restoration Sites
6-2	Urrutia Site Without-Project Conditions
6-3	Urrutia Site Problems and Opportunities
6-4	Woodlake Site Without-Project Conditions
6-5	Woodlake Site Problems and Opportunities
6-6	Bushy Lake Site Without-Project Conditions
6-7	Bushy Lake Site Problems and Opportunities
6-8	Arden Bar Site Without-Project Conditions
6-9	Arden Bar Site Problems and Opportunities

- 6-10 Urritia Site Best Buy Plan
- 6-11 Woodlake Site Best Buy Plan
- 6-12 Bushy Lake Site Best Buy Plan
- 6-13 Arden Bar Site Best Buy Plan
- 7.1-1 Hydrograph for 1-in-20 Year Event, American River at Fair Oaks,
Raise Plan with Prerelease
- 7.1-2 Hydrograph for 1-in-50 Year Event, American River at Fair Oaks,
Raise Plan with Prerelease
- 7.1-3 Hydrograph for 1-in-100 Year Event, American River at Fair Oaks,
Raise Plan with Prerelease
- 7.1-4 Hydrograph for 1-in-150 Year Event, American River at Fair Oaks,
Raise Plan with Prerelease
- 7.1-5 Hydrograph for 1-in-200 Year Event, American River at Fair Oaks,
Raise Plan with Prerelease
- 7.1-6 Hydrograph for 1-in-250 Year Event, American River at Fair Oaks,
Raise Plan with Prerelease
- 7.1-7 Hydrograph for 1-in-500 Year Event, American River at Fair Oaks,
Raise Plan with Prerelease
- 7.1-8 Hydrograph for 1-in-20 Year Event, American River at Fair Oaks,
Step Plan with Prerelease
- 7.1-9 Hydrograph for 1-in-50 Year Event, American River at Fair Oaks,
Step Plan with Prerelease
- 7.1-10 Hydrograph for 1-in-100 Year Event, American River at Fair Oaks,
Step Plan with Prerelease
- 7.1-11 Hydrograph for 1-in-150 Year Event, American River at Fair Oaks,
Step Plan with Prerelease
- 7.1-12 Hydrograph for 1-in-200 Year Event, American River at Fair Oaks,
Step Plan with Prerelease
- 7.1-13 Hydrograph for 1-in-250 Year Event, American River at Fair Oaks,
Step Plan with Prerelease

7.1-14	Hydrograph for 1-in-500 Year Event, American River at Fair Oaks, Step Plan with Prerelease
7.6-1	Browns Ravine
7.6-2	Folsom Point (Dike 8)
7.6-3	Beals Point
7.6-4	Granite Bay
7.8-1	Vegetation Cover Types 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation
7.8-2	Vegetation Cover Types 7-Foot Dam Raise/482-Foot Flood Pool Elevation
7.8-3	Vegetation Cover Types 12-Foot Dam Raise/487-Foot Flood Pool Elevation
7.8-4a	Step Release Plan Impacts on Vegetation, Lower American River Miles 0 to 5
7.8-4b	Step Release Plan Impacts on Vegetation, Lower American River Miles 5 to 13
7.8-4c	Step Release Plan Impacts on Vegetation, Lower American River Miles 13 to 20
7.8-4d	Step Release Plan Impacts on Vegetation, Lower American River Miles 20 to 23
7.11-1	Area Surveyed, Folsom Reservoir, Goose Flat Area
7.11-2	Area Surveyed, Folsom Reservoir, Granite Bay Area
7.11-3	Area Surveyed, Folsom Reservoir, Beals Point
7.11-4	Area Surveyed, Folsom Reservoir, Beeks Bight
7.11-5a	Areas Surveyed along Lower American River
7.11-5b	Areas Surveyed along Lower American River
7.11-5c	Areas Surveyed along Lower American River
7.11-5d	Areas Surveyed along Lower American River
7.11-5e	Areas Surveyed along Lower American River
7.11-5f	Areas Surveyed along Lower American River
7.11-5g	Areas Surveyed along Lower American River
7.11-6a	Previously Surveyed Areas, Yolo and Sacramento Bypasses Project Area

- 7.11-6b Previously Surveyed Areas, Yolo and Sacramento Bypasses Project Area
- 7.11-6c Previously Surveyed Areas, Yolo and Sacramento Bypasses Project Area
- 7.11-6d Previously Surveyed Areas, Yolo and Sacramento Bypasses Project Area
- 7.11-6e Previously Surveyed Areas, Yolo and Sacramento Bypasses Project Area
- 7.14-1 Noise Receptors along the Temporary Bridge Alignment
- 7.14-2 Noise Receptors near Dikes 1, 2, and 3
- 7.14-3 Noise Receptors near Dikes 4, 5, and 6 and Right Wing Dam
- 7.14-4 Noise Receptors near Dikes 7 and 8 and Mormon Island Dam
- 10-1 Typical Construction Schedule for all Folsom Dam Raise Alternatives
- G-1 Example of Monte Carlo Simulation to Determine Flood Risk